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Chapter 4

Marco Mason 2018, **Design-driven Innovation for Museum Entrances** in *Museum Thresholds: The Design and Media of Arrival*, Edited by Ross Parry, Ruth Page and Alex Moseley, Routledge

The museum threshold presents a fascinating design challenge. Can we (or do we) overtly design a space that is *liminal*? In today's condition, one suggested as a 'postdigital' space (Parry 2013), should media play a crucial role in redefining how visitors encounter information and experience? And, in such a transitional space, how can digital media and physical space be interwoven, to accommodate and lead visitor flow, and to create a new type of 'information space'?

The contributing authors of this book have carefully investigated the various implications arising from these questions in proposing their interesting perspectives. The museum entrance is a space of "arrival and practicality" yet also "symbolism and aspiration" (see Skellon and Tunstall, Chapter 1) that facilitates the transition from the external experience (pre-visit) to the learning experience of the museum visit. These spaces require the creation of an adequate information space to promote the experiential transition "from being a traveller to being a visitor" (see Mulberg, Chapter 2). They might offer not only services that guide the visitor but are also themselves exhibition spaces that introduce visitors to the museum experience through "artworks in the museum threshold" (see Ride, Chapter 5). This information space can be further enhanced with audible-visual aspects that form or arise from an immersive environment (see Deuchars and Mortensen, Chapter 11) and the visitor experience of the physical space can be expanded through virtual presence such as social media (see Russo and Pond, Chapter 6). From the contributions of the different authors emerges an interesting view that depicts the complexity and richness of these spaces. The intensification of interactions, relationships and experiences fostered by new thresholds (Parry et al, 2014) increases awareness of the challenges that designers have to face when reshaping museum thresholds.

With these considerations in mind, this chapter reflects upon the ways in which the museum threshold may be understood from a 'design thinking' perspective – an approach defined by its human-centred mindset, integrative process and cross-collaborative methodology. This chapter is mindful of the approaches deployed in other sectors and draws on the direct experience gained on the occasion of a design exploration for a hotel information system aiming to enhance the customer experience. It will reflect upon how design thinking offers a crucial approach both to conceptualise the problem of the threshold, and also as a means to improve the visitor experience in these spaces.

The "Future Hotel Experience" project: an illustrative example

While at the Massachusetts Institute of Technology during the two-year outgoing phase of my Marie Curie fellowship[1], I had the opportunity to be involved in a design exploration

[1] The Marie Curie Actions project titled "Digital Media for Heritage: Refocusing Design from the Technology to the Visitor Experience" (started October 2012) is funded by the European Union – Marie Curie Actions International Outgoing Fellowships for Career Development (IOFs). The outgoing stage of the fellowship (Oct 2012- Oct 2014) took place at the Massachusetts Institute of Technology supervised by Professor John Durant from the Science, Technology and Society

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conducted by the Mobile Experience Lab at the MIT Program in Comparative Media Studies[2]. The context was furnished by the Designing Interactions: Media and Mobile Technologies[3], laboratory through which the MIT worked in partnership with Marriott International to explore how digital media could be integrated into the physical space of the hotel lobby in order to transform the hotel experience. Although this project took place within an academic setting, working closely with Marriott International on practical problems offered a real design context. For this reason, this case is presented as an illustrative example for a more theoretical argument on the contribution design thinking might offer to museum thresholds.

The two design contexts, the Marriott hotel lobby and the museum threshold, present several analogies as they are both 'transition spaces' that also provide 'orientation'; they integrate physical and digital worlds; include social media; present environments characterised by dynamic flows, rich interactions and experiences and constitute multimedia environments that consider sound together with other media.

The laboratory brought together students and researchers from many different disciplines (social science, media studies, mechanical and electrical engineering, computer science, architecture and design) who worked in close collaboration with professionals from Marriott International (creative strategy insight and strategy, plus innovation, interactive strategy, and eCommerce specialists). In particular, I collaborated within a multidisciplinary team of four individuals[4]; in addition to myself, the team was composed of two MIT students, interested in computer science and mechanical engineering respectively, and an experience designer from the Massachusetts College of Art and Design. Like the other groups, we closely collaborated with the Marriott team. We developed a design concept that explored both the physical architecture as well as digital media. We realised a prototype for a service integrating a mobile app, a website and a tangible interface to engage customers with the socio-cultural environment of the city of Boston through a visual-based information system (figure 4.1). The underlying idea of our design was to transform the lobby space into an epicentre of social energy that integrated the hotel within the surrounding cultural community of the city.

For the purposes of this chapter I am more interested in the design thinking process (designing) rather than the elements that constitute the final design system resulting from the process (the design). For this reason, the focus is on the design activities. In this section I present design activities conducted and methods employed in an illustrative example before turning to the more theoretical question (see *Discussion* below) of whether and how a design thinking culture might offer an effective means to improve the visitor experience of the threshold.

The design process essentially consisted of the following five phases: defining the design brief and finding opportunities; understanding (contextual inquiry); defining the experience (shaping the concept); shaping interactions and refining the design; and implementing the

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Program; and the return stage (Oct 2014 – Oct 2015) took place at the University of Leicester supervised by Dr. Giasemi Vavoula from the School of Museum Studies.

[2] This activity was part of the research training required by and planed for the Marie Curie research project.

[3] This MIT *Designing Interactions* course (https://architecture.mit.edu/subject/spring-2013-cms634) "explores the future of mobile interactions and pervasive computing, taking into consideration design, technological, social and business aspects. [It] discusses theoretical works on human-computer interaction, mobile media and interaction design, and covers research and design methods. Students work in multidisciplinary teams (often in close collaboration with external partners to solve real problems) and participate in user-centric design projects aimed to study, imagine and prototype concepts illustrating the future of mobile applications and ubiquitous computing."

[4] The author, Kaitlyn Bailey, Kiranmayi Bhattaram, and Sky Tien-Yun Huang.

final prototype.

<INSERT FIGURE 4.1 ABOUT HERE>

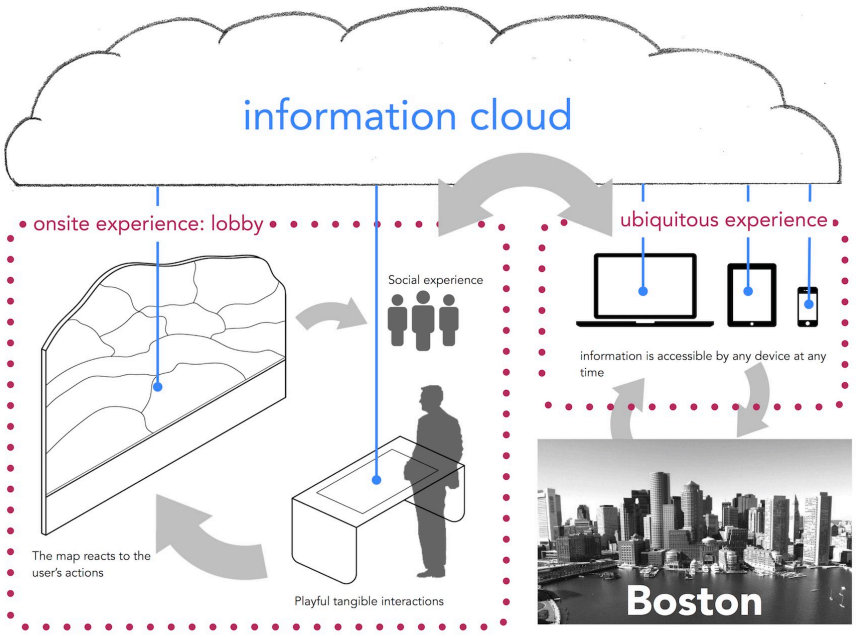

Figure 4.1. Conceptual map of the entire information system. Credit: Kaitlyn Bailey, Kiranmayi Bhattaram, Sky Tien-Yun Huang, and Marco Mason; MIT Mobile Experience Lab.

Finding the design opportunity: the Design Brief[5]

The purpose of this initial phase was to clearly define the design statements in order to identify the design opportunity and state the main design goals, to guide the whole process (table 4.1). The collaboration with the stakeholders from Marriott International was particularly intense during this initial phase. The initial customer research in combination with visual documents representing the company's vision and branding culminated in a design brief, which was the starting point for framing the design problem. It was also a fruitful way to converge the project objectives with the company's strategy (e.g. marketing and branding). Design was a strategic asset as it contributed, from the very beginning, to the early framing of the problem of the hotel lobby. The design thinking approach provided a holistic point of view that fostered a deep understanding of the complex network of relationships between customers, company and lobby space in order to delineate key opportunities.

<INSERT TABLE 4.1 HERE>

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[5] This phase corresponds with the preparative work for the Laboratory. It only involved the MIT research team (lead by Professor Federico Casalegno) and Marriott team.

Table 4.1 The design brief: design statement, the opportunity, and main goals

Reinventing the hotel lobby experience – the design brief		
Design statement	The contemporary business traveller is looking for a familiar environment and a comfortable balance between life and work.	They want to be able to authentically experience the local cultural offering and connect socially at the hotel as well as with the social network they left back at home.
The opportunity	How can the lobby be designed as a social hub for the contemporary business traveller, weaving work with social interactions and immersive localised and customised experiences?	
Design goals	Design and prototype the future lobby – an epicentre of social energy that integrates the hotel with the surrounding local community.	By exploring the intersection between digital media and physical architecture, students will be asked to radically reinvent the hospitality experience.

Table 4.1 The design brief: Design statement, the opportunity, and main goals.

Understanding: the exploratory phase of the design process

Following the initial brief came the understanding phase[6]. This phase consisted of two interwoven sub-phases: the understanding of the design context and empathising with Marriott Hotel customers. The former provided knowledge about the environment, context and circumstances that surrounded the use of the lobby space. The outcome of this research was extremely helpful for our team as it identified: the culture of the company; the main drivers that would shape the future of travel experiences; how the hotel space is changing and how emerging technologies could touch upon every aspect of the guest experience. The latter furnished a deeper understanding of customer needs, and was an activity that we conducted in the field through an ethnographic research methodology. In this phase we literally moved *in-the-field* to observe and conduct contextual interviews. We applied Design Ethnography (Crabtree et al, 2012, pp.1-4; Schneider & Stickdorn, 2011, p.108) to better understand the people for whom we were going to design. This activity was crucial to build up an empathetic understanding of the users. It involves different methods of data collection and, subsequently, techniques to interpret and visually communicate the information gathered. We started observing people in the research context (e.g. the hotel, lobby and surrounding external areas). The *observation* required attentive looking and systematic recording of phenomena that did not only include customer behaviours and interactions, but also those of employers, services and the internal and external environments. We conducted a systematic observation at different times and on different days by using some ethnographic techniques such as fly-on-the-wall (Saffer, 2009, p.86; Hanington & Martin, 2012, p.90), *behavioural mapping* using annotated maps (Curedale, 2013, p.205; Hanington & Martin, 2012, p.90), *picture* and *video recording* (Hanington & Martin, 2012, p.120) and extensive field notes. Also, I personally used a *day-in-the-life* technique (Curedale, 2013, p.230); by which, for two days, I studied the context and captured data from the customer point of view (i.e., I booked a room in the Marriott hotel to become a real customer). Finally, we conducted some informal interviews

[6] This phase actually corresponded with the start of the MIT Laboratory. The MIT research team (lead by Professor Federico Casalegno) and Marriott team had worked on the brief for the six months prior to this phase.

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with guests and hotel practitioners to clarify some aspects and collect other useful data.

All the data collected would have been of little use if it had not been properly analysed and clearly represented and communicated amongst team members. We wrote a brief report in which we synthesised the main insights. We made extensive use of pictures – combined with short descriptions highlighting the essential insights – to illustrate environments and activities (figure 4.2). From the ethnographic exploration we understood that the users for which we had to design our service were discerning, busy and energetic, and always connected; they liked to explore the city, discover new things and meet new people. In order to describe the user we created an archetypical character called a *persona* (Pruitt & Adlin, 2010). This was a page-length description of an individual with a name, picture and a narrative story describing the individual's key aspects, goals and behaviours relevant to the design. We considered this *persona* as a great exercise in empathy; we constantly referred to it during the entire design process whenever a question or concern arose about how aspects of the system should be designed.

Finally, we created an *experience journey map*[7] that was the visualisation of the experiences that customers had as they used the lobby; it essentially pinpointed the interacting factors that formed the existing guests' experiences. These visual deliverables (where the textual information was minimal and was subservient to visual communication) turned out to be very useful for discussing and sharing insights with other teams and stakeholders and, in turn, informed the entire design process.

The understanding gained was pivotal to work on the next phase: the definition of the *user experience framework*.

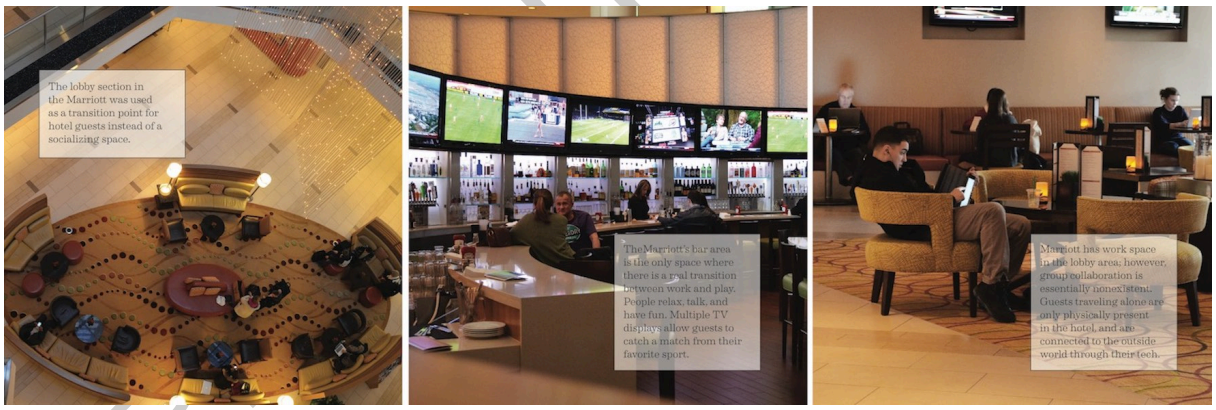

Figure 4.2. Examples of pictures combined with short descriptions highlighting the essential insights to illustrate environments and activities. Credit: Kaitlyn Bailey, Kiranmayi Bhattaram, Sky Tien-Yun Huang, and Marco Mason; MIT Mobile Experience Lab.

Identifying the experience: the User Experience Framework

In this phase, we conceptualised the guest experience by first characterising and then framing the customer experience. Based on what we learnt in the exploration phase, our team started a series of brainstorming sessions in which we elaborated general concepts to conceptualise different experiences. We generated many ideas supported by thinking tools such as sketches and then we quickly tested them through representations such as *scenarios* (Carroll, 2000).

[7] For an exhaustive description of experience journey maps see: Kalbach, J., (2016). *Mapping Experiences: A Complete Guide to Creating Value Through Journeys, Blueprints, and Diagrams*. " O'Reilly Media, Inc.

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This iterative process helped us to (re)define the experience concept defined by the *experience statement* previously identified: "create an experience for guests to 'enter in contact' with the city in order to explore and find out about the city, 'putting guests in contact' with the local cultural offering and enabling them to connect socially at the hotel. The experience should be accessible and provide a fun way to access information. It should also happen through an authentic exploration by introducing guests to the city as locals."

The experience statement worked as a guide for framing the *user experience framework* through which we envisioned the customer experiences. In particular, we used a *customer experience journey map* (figure 4.3), which is essentially a way to express the experience framework visually. This visual representation of the customer experience was particularly useful when combined with the persona, as we could experiment how our user (or, as we called him, 'Steve') could move in his 'journey'; the map facilitated empathic engagement with Steve and allowed us to think and then identify which interactions best suited the different experiences we identified in the experience journey map.

We then used this map to move forward with the design. It was, for us, a tool for thinking about and generating ideas for possible interactions users could perform. The journey map was useful in framing not only the customer experience, but also the beginning of the interaction design phase, which is the definition of essential touchpoints[8] through which customers interact with the service. In other words, once the visitor experience framework was defined, the *experience journey map* helped us to explore high-level interactions that 'Steve' could perform during his experience in the hotel lobby and in the city of Boston.

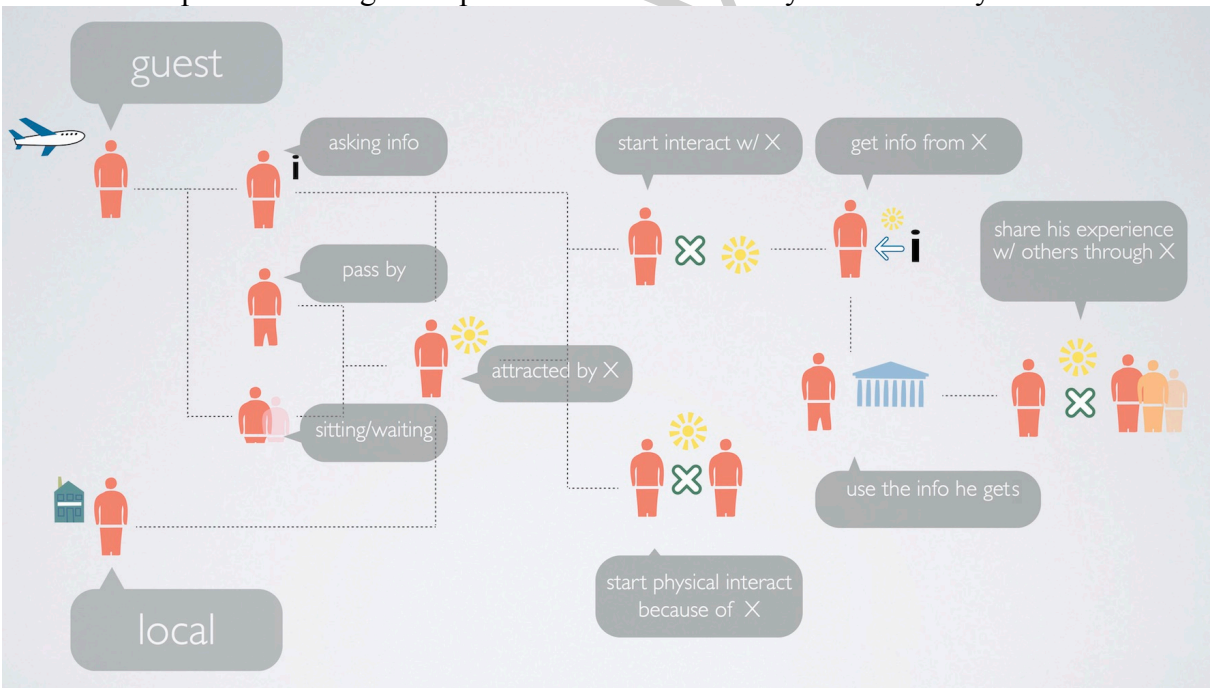

Figure 4.3. Customer experience journey map for the information system. Credit: Kaitlyn Bailey, Kiranmayi Bhattaram, Sky Tien-Yun Huang, and Marco Mason; MIT Mobile Experience Lab.

[8] For an exhaustive description of touchpoints see: Halvorsrud, Ragnhild, et al. (2014). 'Components of a visual language for service design.', *Proceedings of ServDes* (2014): 291-300 or Meyer, C., and Schwager, A. (2007). 'Understanding customer experience.', *Harvard business review* 85(2): 116.

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Shaping interactions and refining the design

Once we had defined the touchpoints and high-level interactions, we took those interactions to a further level of definition by using a *storyboard* to provide a visual narrative that helped us understand how the context, experiences and interactions could come together with technical factors. The storyboard worked as a visual tool to foster discussion amongst different team members with heterogeneous expertise. This storytelling technique was particularly helpful for defining *where*, *how* and *why* our user engaged with the elements of the system we were designing (the *what*). In our collaborative workshops the storyboards were able to clearly point out the key elements of the service we were developing, encouraging discussion on which interactions might or might not work. The storyboard worked as a low-fidelity prototype for quickly testing ideas and adopting the most promising one, and then moving forward with the design of each element of the system (mobile app, website, multi-touch screen, the tangible wall).

The storyboard provided a common interaction framework that gave our team the opportunity to focus on single parts of the system independently, without losing the coherence of the overall design. For example, we could focus on the design of the multi-touch table, which was a particularly challenging element of the system. In order to give hotel guests the opportunity to experience a tangible interaction for manipulating digital data, the user could choose to put objects on the screen that were equipped with sensors and located in the proximity of a multi-touch table. Each object represented a specific and significant socio-cultural aspect of the city of Boston (e.g., the lobster represented the 'local food'). If the user put an object (e.g., the lobster) on the multi-touch table, the interface reacted by suggesting the neighbourhoods with a high concentration of restaurants serving local food (figure 4.4). If the user decided to put another object on the same screen (e.g., the shopping bag, which represented 'shopping') the interface automatically suggested the neighbourhood(s) resulting from the combination of restaurants and shops. Basically, a dynamic infographic – supported by a database – showed the best combination(s) resulting from the user's choice. Simultaneously, the screen right in front of the user displayed the neighbourhood(s) on a large tangible map and showed pictures that evoked the atmosphere of those neighbourhoods.

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Figure 4.4. Prototype of the multi-touch screen to test the interactions for the best combination(s) resulting from the user's choice. Credit: Kaitlyn Bailey, Kiranmayi Bhattaram, Sky Tien-Yun Huang, and Marco Mason; MIT Mobile Experience Lab.

The information simultaneously displayed on both the multi-touch table and the tangible wall was uploaded in real-time on the web mobile app, as the database was stored on the Internet,

and each element of the system – the multi-touch screen, the tangible wall and the web mobile app – was part of the network.

In order to design and develop each element we made great use of different prototypes. We started with 'quick and dirty' paper prototypes (figure 4.5), then used mixed-fidelity prototypes (figure 4.6) and Wizard-of-Oz simulation (Hanington & Martin, 2012, pp.204), and finally high-fidelity prototypes. Following a series of successive prototype iterations, we moved from an abstract framework to more tangible interactions, then to concrete graphic and tangible interfaces.

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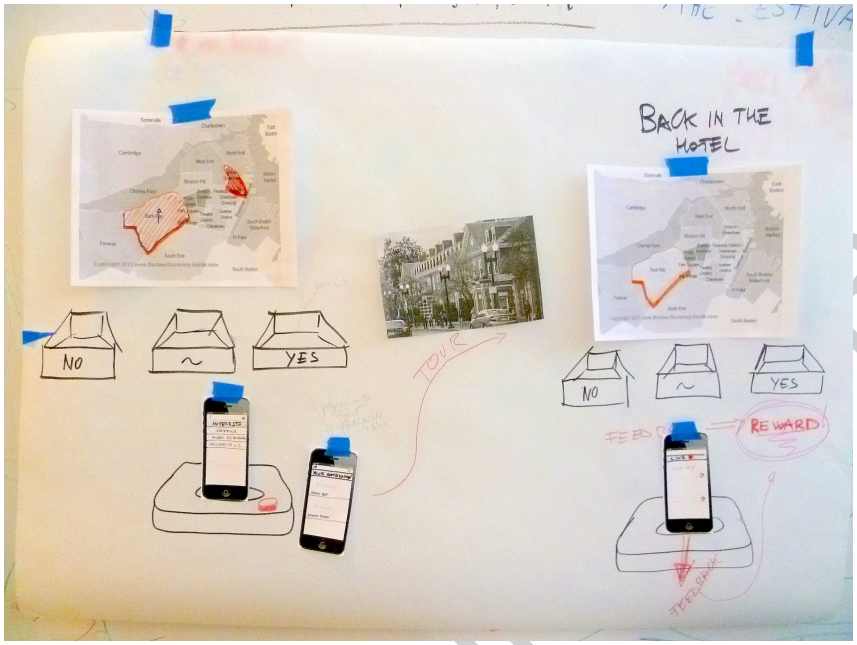

Figure 4.5. Paper prototype to try out interactions on the multi-touch screen. Credit: Kaitlyn Bailey, Kiranmayi Bhattaram, Sky Tien-Yun Huang, and Marco Mason; MIT Mobile Experience Lab.

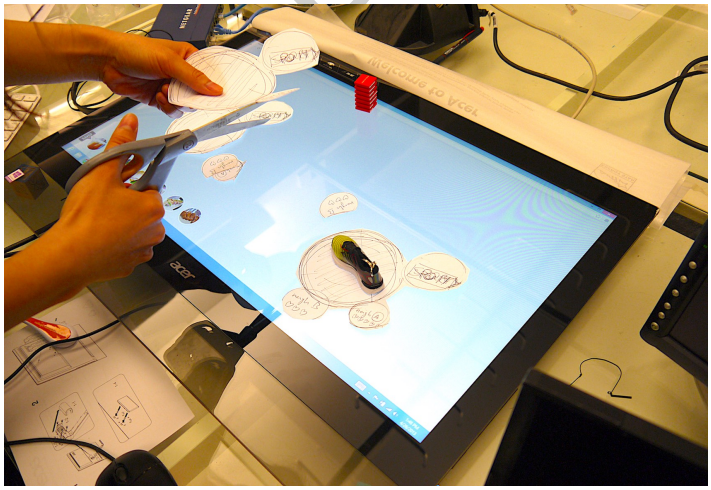

Figure 4.6. Mixed-fidelity prototype to try out interactions on the multi-touch screen. Credit: Kaitlyn Bailey, Kiranmayi Bhattaram, Sky Tien-Yun Huang, and Marco Mason; MIT Mobile Experience Lab; Marriott International.

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The iterative design process toward the final design solution

We adopted a successive cycle of iterations as our process, each constituting an understanding of the specific problem (analysis), followed by idea generation and identification of possible solutions (synthesis) and concluding with testing the solution with prototypes (testing). At the end of each iteration, we verified our solution against the whole design framework defined in the previous phases. As our design process was strongly iterative, the solutions we found at the end of each iteration required us to revisit the whole experience framework and eventually make small refinements.

We moved forward through several layers of design, from abstract concepts to experience to interactions and finally the granular details. In order to accomplish this process, we performed design activities on more than one level throughout the project. We have to think of our process as a system of design decisions we made whilst the activities were taking place, at different levels of design: experience, interaction and interface. At the more abstract level we defined the high-level *experience framework* of the comprehensive structure of the visitor's experience, which is the conceptual foundation for further design on the interaction level. On the *level of interaction* we defined the functional structure constituted by: a) the information architecture that structured the content; and b) the interaction framework that defined the interactions with the information system. At this level it is about structuring content and designing interactions. Finally, at the *level of interface* we developed the granular and detailed components of the digital interfaces constituting the information system. At this level it is about designing the layout, navigation and graphic elements of the digital artefact, considering these as part of the overall context of experience and interactions.

The 'Future Lobby experience' offers an example of design practice that, starting from *empathy* with users, followed a *collaborative* and cross-disciplinary approach that made significant use of *visual tools* and *prototypes* of all sorts throughout the entire *iterative design process*, which culminated in an innovative solution for the problem of lobby space in the hotel.

How can this design thinking practice be harnessed to rethink the idea of the museum threshold? In the following sections I will answer this question by framing the discussion around these underlying principles – empathy, collaboration, iterative process, prototypes, and visual tools – with the purpose of articulating them around a suitable theoretical argument for stimulating readers' reflections and offering the basis to support practical approaches.

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Discussion

Design thinking as strategic asset

In the Marriott project the expertise and way of thinking designers employ to solve complex problems were brought in at the start of the process in order to frame the problems properly, identify design opportunities, and generate ideas; rather than focusing right away on a specific technology and what it can do. Brown (2008, p.84) stresses how, in the past, the development process has considered *design* as a conclusive step in which designers emerged late in the process to "put a beautiful wrapper around the idea." In his seminal article on design thinking, the author goes on to describe how, during the last two decades, this tendency has been inverted and nowadays, the contribution of designers has increasingly become a strategic

asset. This should also be the case for museums that are facing new challenges, including revisiting threshold spaces and the experiences they foster. Verganti, one of the first scholars to promote 'design-driven innovation', stressed the value of design thinking culture for industry and organisations such as museums to innovate, as it goes beyond the aesthetic and technical aspects of design (Verganti, 2013). Also, Macdonald (2007, pp.149-162) confirms a similar tendency when she writes that, in the recent past, exhibition designers were only required to supply "a more or less attractive medium for presenting content", whereas now design is (or should be) an integral part of the visitor experience with "far-reaching implications for structuring the very nature of that experience."

The challenges posed by the new museum threshold – such as the use of media that promotes new types of encounters and the demand for the integration of the experiences of playing, learning, discovering and buying – requires radically rethinking the visitor experience. Design, therefore, becomes a strategic innovative asset by promoting the early exploration of opportunities; and the building up of new ideas leading to innovation is strongly encouraged in the very early stages of the project (Baeck & Gremett, 2011, pp.229-250).

This shift entails a deep understanding of the visitors' needs, motivations, and emotions; and a different way of thinking and doing that is based on a cross-disciplinary approach supported by suitable design methods and techniques.

Empathic understanding of user experience

The main challenge posed by the Marriot Hotel threshold design was envisioning a new way of engaging the customer and offering them a new type of service. We adopted a design thinking approach that employed empathic user research methods – such as observations and contextual interviews – to identify unrealised needs and expectations in order to design an innovative product, system, or service that has yet to be thought of. Moggridge (2008, pp.1-12) says that in innovative designs the goal is to create something new that is difficult to explain even to research participants. This scenario reveals a similar purpose to the research and experimental projects presented in this book, which aim at reframing museum thresholds in a way that actual visitors might not envisage yet. For this reason, reinventing these spaces requires discovering latent needs and desires and responds with innovative solutions that should identify, shape and support new threshold experiences.

Design thinking is unanimously acknowledged as an approach that promotes the use of methods for designing objects and services that match people's needs (Brown, 2009; Lockwood, 2010; Martin, 2009; Verganti, 2013) and sees things from users' perspectives (Ward et al, 2009, pp.78-84). Dong (2014, pp.1-16) and underlines how design-inspired innovation in industry and organisations is strongly driven by the fulfilling of the desired qualities of the final product or service in terms, for example, of high emotional value, degree of newness, and being more socially responsive. After all, is not the satisfaction of visitor needs, emotions and expectations one of the most important drivers of innovation in twenty-first-century museums? (Bearing in mind that the growing adoption of digital technology is just a means to pursue this goal).

At the core of these methods is *empathy*, which Brown (2009) defines as the "effort to *see* the world through the eyes of others", "*understand* the world through their experiences" and "*feel* the world through their emotions." Adopting an empathic approach essentially means to develop a deep understanding of the users in their real context (Rogers, 2011, pp.58-62) by

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collecting qualitative data in order to understand people in the context of their experience. These techniques aim to obtain insights into the *why* and *how*, and know beyond the *what* users need, expect and desire. This approach can result in a rich source of inspiration for the design, beyond being an effective way to discover user needs (Lockwood, 2010, p.xi).

Nowadays, a main feature of innovation is the focus of attention on the quality of the user experience rather than on technology; this is to satisfy the needs and expectations of people who will use the final product or service (Dong, 2014, pp.1-16). However, this attention on people is not a sufficient condition to guarantee innovation if it is not supported by an appropriate collaborative process that employs suitable design methods and tools (Lockwood, 2010, pp.xi-xvii).

Multidisciplinary collaboration

The value in early exploration of opportunities and ideas is emphasised by the need for a collective approach to the problem of the threshold. Collaboration amongst different areas of expertise (and, so, different disciplines) becomes an essential boost for innovation (Bremner & Rodgers, 2013, pp.4-13). It is not necessary to look outside of our context to find confirmation of the value of a multidisciplinary approach to deal with new design challenges. The projects that provide the theoretical foundation for this book – *Transforming Thresholds*[9] – started from the assumption that disciplines (apparently) far from exhibition design and architecture can influence and contribute to reframing museum thresholds. In particular, observers in the digital museum context (Freeman et al. 2016 ; Merritt, 2015) envision the integration of digital and physical worlds for configuring information spaces such as new museum thresholds; this requires collaborative practices that bring together skills and expertise from different backgrounds to inform design (Roberts, 2014, pp.191-209).

Returning to our discussion, multidisciplinarity is much needed, for the transformation of actual threshold spaces as innovation cannot be driven by (technical) specialists alone; instead it requires the active participation of museum professionals and other stakeholders in the creative process because the nature of design problems presented by new threshold spaces is complex and, thus, dealing with those problems require the integration of different knowledge domains(Adelson & Soloway, 1988, pp.185-208). The solution of such design problems "is not any longer in one silo of expertise but in the mix, as not one single discipline owns the solution" (Helsinki Design Lab). Design thinking promotes working at the intersections of different areas of knowledge as I will describe in the following sections, by defining the complex nature of threshold design problems and then making the case for an iterative process to support collaborative practice in tackling this complexity.

Defining threshold complexity

The problem of the Marriott hotel lobby space, as well as the museum thresholds, disclosed a certain degree of complexity. Designing for museum thresholds is not only about the interactions necessary for performing particular visitor tasks – i.e., when a visitor touches buttons on a screen positioned in an multimedia kiosk in order to obtain information about an artwork – but also about designing workflows, experiences and interactions that weave together (digital) content, objects of display, information, visitor needs and expectations and both physical (indoor and outdoor) and digital spaces, while balancing these against the

[9] http://transformingthresholds.weebly.com

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museum's objectives and strategy. According to Buchanan's "four orders of design" (Buchanan, 2001, pp.3-23) – in which the scholar proposes *symbols*, *things*, *actions*, and *environments as* four criteria to define design complexity – it is possible to situate thresholds in all the four orders. The museum threshold can present design challenges at the first-order, for the design of *symbols* in form of 'visual communication' such as infographics; and/or at the second-order, for example, to design *things* such as 'material objects' and multi-touch table interactives; and/or at the third order to design *interactions* for activities and organised services. Together the first three orders can form an *environment* (fourth order) integrating human, digital and material systems (Buchanan, 2001, p.12).

As has been discussed at length by many design theorists (Buchanan, 1992, pp.5-21; Coyne, 2005, pp.5-17; Farrell & Hooker, 2013, pp.681-705) these kinds of design issues are more specifically described as "wicked problems", referring back to Rittel, who suggests that the term refers to a "class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing" (Churchman, 1967, pp.141-142). To successfully deal with "wicked problems", it is not possible to formulate all the problems and *then* find a final solution, as it happens in some technical domains where it is feasible to reason from problems to solutions in a relatively controlled and orderly way (Dorst, 2006). On the contrary, because a wicked "problem is not understood until after the formulation of a solution" (Conklin, 2006) and it is very hard to define all the problems at the beginning and *then* move to the final solution, design thinking proceeds by iterative steps in which there is a constant alternation of the understanding of a portion of the whole problem and testing a possible solution for that specific problem toward the final design that results from such evolution.

The need of iterative process in dealing with complexity

The creative design process repeats itself at different times as it moves toward the final best solution (Rittel & Webber, 1973, pp.155-169). Dorst and Cross (2001, pp.425-437), in their seminal experiment, showed that the problem-solving process of facing "wicked problems" adopted in design thinking is non-linear and can be described as a "co-evolution of problem and solution spaces." According to the authors, the design process facing "wicked problems" is a continuous process of testing and learning *(pp. 425-437)*:

> *"It seems that creative design is not a matter of first fixing the problem and then searching for a satisfactory solution concept. Creative design seems more to be a matter of developing and refining together both the formulation of a problem and ideas for a solution, with constant iteration of analysis, synthesis and evaluation processes between the two notional design 'spaces' - problem space and solution space."*

As we saw in the Marriot threshold project, the analysis essentially consisted of the understanding (and not the definition) of the problem space; the synthesis reflected on the problem by generating ideas for a possible solution, and the evaluation tested the idea for a solution. This co-evolutionary process allowed our team to advance and refine the design – from an abstract level to a more concrete form – throughout different levels of design by undertaking successive iterations of problem/solution cycles (from the early vision to the granular detail of the final design). In the same way, the design process adopted for transforming museum thresholds should move through successive levels of design – from

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experience to service to interaction to graphic interface components – adopting consecutive cycles of analysis-synthesis-evaluating.

In such "co-evolutionary" design processes, where problems and solutions evolve together, prototyping plays a fundamental role in deepening the understanding of a solution throughout each iteration. Prototyping allows for the evaluation of a possible solution and then the use of the feedback to create a new prototype, advancing the design toward the final best solution (Mason, 2015, pp.394-426).

Prototyping

Prototyping is an essential practice in collaborative design thinking, since it is a catalyst for the different voices involved in the project: museum practitioners, designers, developers and other stakeholders (Mason, 2015, pp.394-426). Prototypes facilitate conversation amongst members of the team by translating ideas through more tangible examples. Museum and design team members have different types of prototypes at their disposal to explore possible solutions and their suitability, according to the particular problems faced during the design process. This can happen in any phase of the design, even in the generation of early concepts, as prototyping does not always require the creation of complex and expensive artefacts (Brown, 2008, p.84). For example, creating low-fidelity prototypes does not require any particular skill, encouraging the participation of professionals with different backgrounds, even those without specific digital development skills (i.e., curators, conservators and educators). This represents one of the strategic values of design thinking: the possibility to experiment early, fail early and explore a lot of possible solutions early (Mitroff Silvers et al., 2013).

The "culture of prototyping" is at the basis of design thinking (Curedale, 2013, p.39) as it is related to the "continuous learning" that takes place during the entire design process, from the very early phase to the final product. During the iterative process of the co-evolution of problems and solutions (as described above), team members go through a learning process as they gather knowledge by experimenting with solutions (Dorst, 2011, p. 521) as happened in the design thinking process followed in the Marriot project, in which prototypes were utilised from early steps through to the conclusion of the project: from prototyping ideas (e.g. low-fidelity prototypes) to testing advanced interactive artefacts (e.g. high-fidelity prototypes).

Generally speaking, a low-fidelity prototype consists of an unfinished and sketched draft used to test design concepts (figure 4.5). A low-fidelity prototype does not have an advanced degree of definition, and it usually looks different from the final design. A low-fidelity prototype can be anything from a storyboard sketched on paper, to sketchy wireframe drawings, to functional 'quick and dirty' drafts of the final design. For example, in the Marriott project, we saw that an effective way to explore and develop concepts for the visitor experience can be through the creation of stories. Design scenarios and storyboards are effective ways to visualize the 'experience framework' by drawing a sequence of both events and actions visitors may perform during their journey while moving between the physical space and the digital media system. On the other hand, a high-fidelity prototype for digital interactives has a great level of definition (figure 4.4), which can appear very similar to the final digital artefact – a prototype may even evolve into that solution. A high-fidelity prototype is a digital artefact and has different functionalities implemented. It is not always possible to opt for a low- or high-fidelity approach, because there are situations during the design process that require team members to make a compromise between these two kinds of techniques; however it is possible to take

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advantage of the characteristics of both approaches through *mixed fidelity* prototypes (figure 4.6), that combine low- and high-fidelity techniques within the same artefact.

Visualisation to accelerate learning and foster collaboration

In the Marriot example, our team employed a range of visual techniques that offered a common language to increase communication within our multidisciplinary team, and with the client and other teams. This enhanced collaboration, encouraged participation, and boosted creativity, hence fostering innovation (Carlgre et al, 2014, pp.403-423). Design thinking promotes the extensive use of visualisation for understanding and sharing (Curedale, 2013, p.36). According to Ogilvie and Liedtka (2011, p.49), "visualization is the mother of all design tools" as visual tools support design activities during the entire process – from the exploration of the context to the experience framework to the interface flowcharts. Team members can use visualisation tools either internally or externally. In the former case they help to stimulate and spark idea generation; for example, during brainstorming sessions as the members of the team can see what others are thinking and build on top of this. Explaining ideas only with words or text exposes the risk that each member forms her own mental pictures which can substantially differ from those of others, especially in a multidisciplinary team – as individuals see things from their own perspective which is influenced by their own background. In the latter case, when different teams cross-collaborate or communicate with the client, visualisation considerably reduces the risk of misinterpretation because verbal or textual explanations are more subject to diverse interpretations than images (Brown, 2010). For example, Vavoula and Mason (2017, p. 251) use the term *Intermediary Design Deliverables* to distinguish the type of visual communications delivered by the designer to the client from other design representations that may be used only internally within the design team. According to the authors, Intermediary Design Deliverables' primary purpose is to communicate design progress, process and outcomes to external partners; they are "the progressive objectification of the exhibit-idea throughout the series of intermediary deliverables, with the process culminating in a fully-fledged, tangible object: the exhibition itself."

Conclusion

The Marriot project has offered the opportunity to describe how the team went through a design thinking process that has revealed six main tenets. Design thinking is a *strategic* asset to increase innovation by bringing in a design mindset from the beginning and fostering generation of concepts. It is a *human-centred design practice* that aims to develop a deep and empathic understanding of visitor experience. Also, it is a *collaborative practice* carried out by multidisciplinary teams and, often, with users, which follow an *iterative process* that helps them to move from generating insights about end users to idea generation and testing and finally, to implementation and an approach. *Prototyping* is considered an integral practice within the iterative process, in which a large-scale *adoption of visualisation methods* accelerates learning and foster collaboration.

In the museum world, as in other settings, the contribution of embracing a design thinking philosophy consists of innovation that originates from multidisciplinary processes; methods to foster teamwork and creativity and advanced prototyping practices in which different human-centred design methods are employed to address the visitors' needs and pursue twenty-first-century museums' objectives.

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References

Adelson, B. and Soloway, E.M. (1988). 'A model of software design', in Chi, M.T., Glaser, R. and Farr, M.J. (eds) *The nature of expertise*. New York: Psychology Press, pp. 185–208.

Baeck, A. and Gremett, P. (2011). 'Design thinking', in Degen, H. and Xiaowei, Y. (eds) *UX best practices: how to achieve more impact with user experience*. New York: McGraw-Hill, pp. 229–250.

Bremner, C. and Rodgers, P. (2013). 'Design without discipline', *Design Issues*, 29(3), pp. 4–13.

Brown, T. (2008). 'Design thinking', *Harvard business review*, 86(6), p. 84. Brown, T. (2009). *Change by design*. New York: Harper Collins.

Brown, D.M. (2010). *Communicating design: developing web site documentation for design and planning* (2nd edition). Berkeley, CA: New Riders.

Buchanan, R. (1992). 'Wicked problems in design thinking', *Design Issues*, 8(2), pp. 5–21.

Buchanan, R. (2001). 'Design research and the new learning', *Design Issues*, 17(4), pp. 3–23.

Carlgren, L., Elmquist, M. and Rauth, I. (2014). 'Design thinking: exploring val- ues and effects from an innovation capability perspective', *The Design Journal*, 17(3), pp. 403–423.

Carroll, J.M. (2000). *Making use: scenario-based design of human-computer inter- actions*. Cambridge, MA: MIT press.

Churchman, C.W. (1967). 'Wicked problems' (Guest Editorial), *Management Science*, 14(4), pp. 141–142.

Conklin, J. (2006). *Dialogue mapping: building shared understanding of wicked problems*. Chichester, UK: Wiley Publishing.

Coyne, R. (2005). 'Wicked problems revisited', *Design Studies*, 26(1), pp. 5–17. Crabtree, A., Rounce eld, M. and Tolmie, P. (2012). *Doing design ethnography*.

London: Springer Science & Business Media. Curedale, R. (2013). *Design thinking: process and methods manual*. Topanga, CA:

Design Community College Incorporated. Dong, A. (2014). 'Design × innovation: perspective or evidence-based practices',

International Journal of Design Creativity and Innovation, 2014, pp. 1–16. Dorst, K. (2006). *Understanding design*, revised edition. Amsterdam: BIS Publishers. Dorst, K. (2011). The core of 'design thinking' and its application. *Design Studies*,

Dorst, K. and Cross, N. (2001). 'Creativity in the design process: co-evolution of
problem–solution', *Design Studies*, 22(5), pp. 425–437. Farrell, R. and Hooker, C. (2013). 'Design, science and wicked problems', *Design Studies*, 34(6), pp. 681–705.

Freeman, A., Adams Becker, S., Cummins, M., McKelroy, E., Giesinger, C. and Yuhnke, B. (2016). *NMC Horizon Report: 2016 Museum Edition*. Austin, TX: The New Media Consortium.

Hanington, B. and Martin, B. (2012). *Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solu- tions*. Beverly, MA: Rockport Publishers, p. 90.

Helsinki Design Lab (HDL) (2010). *What is strategic design?* Available at: www. helsinkidesignlab.org/pages/what-is-strategic-design. [Accessed: 5 February 2018.] Lockwood, T. (2010). *Design thinking: integrating innovation, customer experi-*
ence, and brand value. New York: Skyhorse Publishing. Macdonald, S. (2007). 'Interconnecting: museum visiting and exhibition design',
CoDesign, 3(S1), pp. 149–162. MacLeod, S., Dodd, J. and Duncan, T. (2015). 'New museum design cultures:
harnessing the potential of design and design thinking in museums', *Museum Management and Curatorship*, 30(4), pp. 314–341. Martin, R. L. (2009). *The design of business: why design thinking is the next com-*
petitive advantage. Cambridge, MA: Harvard Business Press. Mason, M. (2015). 'Prototyping practices supporting interdisciplinary collaboration in digital media design for museums', *Museum Management and Curatorship*, 30(5), pp. 394–426.

Merritt, E.E. (2015). *Trendswatch 2015*. Available at: https://aam-us.org/docs/ default-source/center-for-the-future-of-museums/trendswatch-2017.pdf?sf vrsn=2. [Accessed: 5 February 2018.]

Mitroff Silvers, D., Lytle-Painter, E., Lee, A., Ludden, J., Hamley, B. and Trinh, Y. (2014). 'From post-its to processes: using prototypes to nd solutions', *Museums and the Web 2014*. Available at: http://mw2014.museumsandtheweb.com/paper/ from-post-its-to-processes-using-prototypes-to- nd-solutions. [Accessed: 10 February 2016.]

Mitroff Silvers, D., Wilson, M. and Rogers, M. (2013). 'Design thinking for visi- tor engagement: tackling one museum's big challenge through human-centered design', *Museums and the Web*. Available at: http://mw2013.museumsandtheweb. com/paper/design-thinking. [Accessed 1 October 2016.]

Moggridge, B. (2008). 'Innovation through design', *International Design Culture Conference – Creativeness by Integration*. Seoul, South Korea, 30–31 May 2008, pp. 1–12. Available at: www.ideo.com/images/uploads/news/pdfs/KDRI_BillM_ Paper.pdf. [Accessed: 10 February 2016.]

Ogilvie, T. and Liedtka, J. (2011). *Designing for growth: a design thinking toolkit for managers*. New York: Columbia University Press, p. 49.

Parry, R. (2013). 'The end of the beginning: normativity in the postdigital museum', *Museum Worlds*, 1(1), pp. 24–39.

Parry, R., Moseley, A. and Kristiansen, E. (2014). 'On a new threshold: experiments in gaming, retail and performance design to shape museum entrances', *Museums and the Web 2014*. Available at: http://mw2014.museumsandtheweb.com/paper/ on-a-new-threshold-experiments-in-gaming-retail-and-performance-design-to- shape-museum-entrances. [Accessed: 20 February 2016.]

Pruitt, J. and Adlin, T. (2010). *The persona lifecycle: keeping people in mind throughout product design*. San Francisco, CA: Morgan Kaufmann. Rittel, H.W. and Webber, M.M. (1973). 'Dilemmas in a general theory of planning',
Policy sciences, 4(2), pp. 155–169. Not for distribution

Roberts, T. (2014). 'Interpretation design: an integrative, interdisciplinary practice', *Museum and Society*, 12(3), pp. 191–209.

Rogers, Y. (2011). 'Interaction design gone wild: striving for wild theory', *Interactions*, 18(4), pp. 58–62.

PREPRINT VERSION

Saffer, D. (2009). *Designing for interaction: creating innovative applications and devices*. Berkeley, CA: New Riders, p. 86.

Schneider, J. and Stickdorn, M. (2011). *This is service design thinking: basics, tools, cases*. Hoboken, NJ: Wiley.

Vavoula, G. and Mason, M. (2017). 'Digital exhibition design: boundary crossing, intermediary design deliverables and processes of consent', *Museum Management and Curatorship*, 32(3), pp. 251–271.

Verganti, R. (2013). *Design driven innovation: changing the rules of competition by radically innovating what things mean*. Cambridge, MA: Harvard Business Press. Ward, A., Runcie, E. and Morris, L. (2009). 'Embedding innovation: design thinking

for small enterprises', *Journal of Business Strategy*, 30(2/3), pp. 78–84.

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